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University of Nebraska–Lincoln Water Center

WATER CURRENT

Vol. 39, No. 2 Spring 2007

University of Nebraska Lincoln

Annual Tour Ready to Explore New Mexico's Lower Pecos River

Keith Duncan of New Mexico State University, UNL Water Center associate director Mike Jess and Aaron Curbello, manager of the Carlsbad Soil and Water Conservation District, discuss plans for the June Water and Natural Resources Tour. The aqueduct in the background serves irrigators in the Carlsbad Irrigation District (photo: Steve Ress).

By Steve Ress

The itinerary is set and the seats have been filled for an early June bus tour to New Mexico's lower Pecos River basin.

The University of Nebraska–Lincoln's annual Water and Natural Resources Tour begins in Albuquerque, N.M. on Monday, June 4 and ends there Thursday, June 7.

The tour will compare and contrast interstate water compacts on Nebraska's Republican River and New Mexico's Pecos River to see what can be learned from the latter's compact with Texas.

Tour co-organizer Mike Jess, associate director of the UNL Water Center, said similarities between the two river basins in terms of flow, agricultural usage, and importance to their respective states, and how interstate compacts and lawsuits have affected water use by the compact states, are striking.

"Nebraskans can learn a great deal on how we might be able to resolve our challenges on the Republican River by hearing and observing what's been done on the Pecos (river) over the past 20 years," he said.

Both basins are plagued with overappropriated stream flows and overcommitted groundwater supplies. Interstate compacts, adopted in both basins in the

(continued on page 11)

Sandhills Dunes May Be More Stable Than Was Thought

By Brent Atema
UNL College of Journalism and Mass Communications

Three years ago, University of Nebraska–Lincoln researchers began studying the stability of western Nebraska's Sandhills.

The SandHills Biocomplexity Project, a $1.8 million National Science Foundation funded project, was designed to study the history of grassland destabilization and how long- and short-term climate change might affect their stability.

"This project is about sand, grass, and water, their interactions, and the stability of the 58,000 square-kilometer Nebraska Sandhills over the last few thousand years," the project's grant proposal said.

(continued on page 12)

Inside

IANR

WRAP Group Comes to Campus!

from the DIRECTOR

Kyle D. Hoagland

You may have seen reference to the Water Resources Advisory Panel (WRAP) in the newspaper or through materials published by the University and wondered how it relates to the UNL Water Center and our Water Resources Research Initiative (Water Initiative). Given all of their good work already, I thought it pertinent and of interest to explain more of this in-depth.

Several factors prompted UNL administrators to form this external advisory group (in addition to its cool acronym). Water has clearly become a defining issue for our state, and a myriad of serious challenges face Nebraska's water resources decision-makers.

How these challenges are addressed will impact the future of water management in Nebraska, and ultimately the sustainable use of this invaluable resource. Both UNL's Land-Grant mission (teaching, research, and extension), and its significant educational and research capacity in water positions UNL to help address these challenges.

The Water Initiative represents an internal "push" toward integrating and promoting excellence in water research efforts at NU, on both the state and national levels, that is, to "*Become a national leader in water resource research, education and outreach*". By recognizing water as a program of excellence area, UNL has made internally reallocated funds available for conference development, new water faculty hires, infrastructure improvements (i.e. major equipment), research workshops and retreats, etc.

An objective of the Water Initiative is to enhance the University's connections with state and federal agencies, as well as with Natural Resources Districts (NRDs), irrigation districts, agri-business organizations, non-governmental organizations (NGOs), and others with strong ties to Nebraska water resources concerns. With these factors converging, the time was right to better connect the University with those who often rely on NU water-related research; thus, the WRAP was created.

What is the WRAP? To gain wide representation of water-decision makers, while keeping the group small enough for effective communication, flexibility, and decision-making, Dr. John Owens, NU Vice President and IANR Harlan Vice Chancellor and Dr. Prem Paul, Vice Chancellor for Research and Dean of Graduate Studies, asked ten members, representing a wide cross-section of the water-decision making community, to serve on the WRAP to provide advice and guidance to the University of Nebraska on state water research needs, education, and outreach programs.

Formal invitations to the ten chosen members were sent on February 14, 2006 and the WRAP convened a month later and has had several meetings since.

Current WRAP members include: Ann Bleed, Nebraska Department of Natural Resources; Eugene Glock, Cedar Bell Farms; Glenn Johnson, Lower Platte South NRD; Mark Brohman, Nebraska Environmental Trust; Don Kraus, Central Nebraska Public Power and Irrigation District; Kirk Nelson, Nebraska Game and Parks Commission; Lee Orton, Nebraska Well Drillers Assoc.; Jay Rempe, Nebraska Farm Bureau Federation; Ed Schrock, former Nebraska state senator and chair of Legislature's Natural Resources Committee; and Susan Seacrest, The Groundwater Foundation.

What the WRAP and NU Water Faculty have accomplished so far: (1) WRAP surveyed a wide variety of water stakeholders, including NRDs, environmental groups, and Nebraska Department of Environmental Quality

(continued on page 13)

WATER CURRENT

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Meet the Faculty

Simon Van Donk, Ph.D.

Simon Van Donk is an assistant professor and water resources/irrigation engineer in the University of Nebraska–Lincoln Department of Biological Systems Engineering, UNL West Central Research and Extension Center, North Platte. He joined University of Nebraska faculty in March 2007.

Simon Van Donk

Examples of Current Research/ Extension Programs:

50 percent research/50 percent extension. Management of water resources for sustaining irrigated agriculture in West-Central Nebraska. Emphasis on measuring and modeling of evapotranspiration in various systems (cropping, tillage, irrigation).

Examples of Past Research/Extension Programs:

For the past seven years, van Donk has worked in the USDA - ARS - Wind Erosion Research Unit in Manhattan, Kansas. He designed and conducted field experiments for evaluating the Wind Erosion Prediction System (WEPS). Although WEPS can run using measured ('real') weather data, it is typically used with data generated by stochastic weather generators. He improved the model for the stochastic generation of wind speed and direction, and also did a study comparing WEPS-simulated with measured crop residue cover in North Dakota.

As part of his Ph.D. dissertation research, he created and tested a residue/mulch submodel for ENWATBAL, which is a process-based energy and water balance model. The main reason for introducing a mulch submodel was to make ENWATBAL applicable to conservation tillage systems where crop residues cover the soil, impacting evaporation, transpiration, soil water content, and soil temperature.

Van Donk worked in Africa for about four years in a USAID/USGS project at the Agricultural, Hydrological and Meteorological (AGRHYMET) Center in Niamey, Niger. AGRHYMET has the main goal of making crop yield predictions for early warning purposes. These yield assessments

(continued on page 10)

Shannon L. Bartelt-Hunt, Ph.D.

Shannon Bartelt-Hunt is an assistant professor in the University of Nebraska–Lincoln Department of Civil Engineering and has been a University of Nebraska faculty member since January 2006. Formerly a postdoctoral research associate, Department of Civil, Construction and Environmental Engineering, North Carolina State University, August 2004 to December 2005.

Education:

B.S., Environmental Engineering, cum laude and with departmental honors, Northwestern University, 1998

M.S., Civil Engineering, University of Virginia, 2000

Ph.D., Civil Engineering, University of Virginia, 2004

Examples of Current Research/ Extension Programs:

My current research program involves the fate and transport of organic contaminants of emerging concern, with a special focus on contaminant transport in agricultural and solid waste systems. I am currently investigating the fate of prions in the environment and the survival of Avian Influenza virus in landfill leachate. I am also involved in a project evaluating the transport of antibiotics and hormones from CAFOs to shallow groundwater. Future planned research includes investigating how waste management strategies influence hormone fate and availability in agricultural systems and how current animal carcass disposal strategies may impact water quality.

Examples of Past Research/Extension Programs:

My previous research has focused on the design of impermeable liners for waste containment to mitigate diffusive transport of organic contaminants. In addition, I recently completed a postdoctoral research project to assess the fate of chemical warfare agents and other toxic industrial chemicals after disposal in a municipal solid waste landfill.

Teaching:

CIVE 326 – Introduction to Environmental Engineering

(continued on page 10)

Shannon Bartelt-Hunt

From Kitchen to Countries: A Profile of the Groundwater Foundation

By Susan S. Seacrest
The Groundwater Foundation

From her kitchen table in Lincoln Nebraska to a recent presentation at New York University in New York City, Susan Seacrest has been a passionate advocate of all things groundwater in her role as President and founder of The Groundwater Foundation. Seacrest began the Foundation with a clear vision—to create educated citizens caring about and for groundwater. This mission was the Foundation's starting point and it has remained its central focus for almost 23 years

People often ask Seacrest how an English major ends up devoting her life to groundwater. In response, Seacrest frequently characterizes herself as an educator who loves learning new things—an opportunity The Groundwater Foundation affords on an almost daily basis. The answer also begins with the illness of her oldest child, Logan, now 25. As an infant, Logan was hospitalized multiple times due to a malabsorption disorder. Although not necessarily caused by an environmental problem, Logan's illness gave Seacrest a new appreciation for good health and she was raising her family in Nebraska, one of the healthiest and most wholesome states in the U.S., or so she thought.

This assumption was challenged after reading a 1984 newspaper article describing elevated leukemia and non-Hodgkin's lymphoma occurrences in central Nebraska. Alarmed, Seacrest wrote to the epidemiologist quoted in the story, Dr. Dennis Weisenberger. He responded thoughtfully, explaining his groundwater-related research and challenging Seacrest to learn more. Seacrest took up the challenge and in the process discovered a true avocation—learning about, understanding, and helping others to appreciate the vital resource of groundwater. Hidden from view, groundwater often goes unnoticed; but on examination it emerges as an important source of water for domestic use, irrigation, and ecosystem recharge.

To amplify the profile of groundwater in the public's mind, Seacrest chose to focus on education—a subject that reflected both her educational and professional background. In addition, she had served for several years on the board of the National Arbor Day Foundation and used Arbor Day membership programs and educational activities as her template. Working as a volunteer from her kitchen for the first nine years of the Foundation's existence, friends and colleagues teased Seacrest that when she had a project on the back burner, it was literally on the back burner!

And so from the Seacrest family kitchen, The Groundwater Foundation began featuring traditional non-profit programs like a quarterly newsletter, *The Aquifer*, and an annual fall symposium in partnership with the University of Nebraska Conservation and Survey Division and Water Center, now both part of the School of Natural Resources. Then, in 1988, the Foundation changed course. That fall, elementary students participating in the fall symposium spoke out with a simple statement of concern that "The Platte River won't be there when we grow up." In listening to the youth, Seacrest realized that the next generation of Nebraskans was probably the Foundation's most important audience. As a result, in May 1989 over 2,000 students participated in the first Children's Groundwater Festival, a daylong event that featured hands-on, minds-on activities like "Dripial Pursuit" and "Cornucopia." It has been held annually at Central Community College in Grand Island ever since and today the Festival is led by a partnership of Grand Island organizations that have added their own special flare to the Festival's successful history.

Susan Seacrest

Festivals make a difference too. Pre and post testing, in place at the Nebraska event since 1990, demonstrates statistically significant improvement in student learning. Positive educational outcomes attracted funding and participation, an approach the Foundation has followed in developing subsequent programs. As Seacrest put it in a 1990 interview describing the Festival's success, "Educating youth is just like educating anybody else. You have to make it clear, you have to make it fun, and you have to make it matter."

The commitment to innovation and sustainability gave birth to one of the Foundation's signature programs, Groundwater Guardian. A community recognition program built around the voluntary efforts of diverse stakeholders, Guardian answered a need for a national network of local groundwater protection programs. In addition, Groundwater Guardian allowed Foundation leaders to expand beyond Nebraska and share what they had learned, and in the sharing they enriched their own knowledge by connecting with like-minded people around the world.

Groundwater Guardian projects have included model programs such as Lancaster County's "Test Your Well," a private well testing program so effective that the W.K. Kellogg Foundation profiled it as an outstanding project as part of

(continued on page 13)

NIWR Members Gather for Annual Washington D.C. Conference

by Lorrie Benson
Senior Program Manager
Water Resources Research Initiative

The National Institutes for Water Resources (NIWR) gathered in the nation's capital to encourage Congress to fund water research, education and outreach, and to learn more about future federal water priorities.

The University of Nebraska–Lincoln Water Center is one of the 54 NIWR members, each of which are located in universities, to promote water research, education and outreach programming

All 54 of the member universities were represented at the Feb. 12-14 Washington D.C. conference.

A primary purpose of the meeting was educating U.S. Senators and Representatives about the UNL Water Center and its sister agencies and encouraging Congress to fund the Water Resources Research Act, which provides funding to each NIWR entity.

Robert Hirsch, U.S. Geological Survey associate director for water and chief hydrologists, addresses the annual conference of the National Institutes for Water Resources in Washington D.C. (photo: Kyle Hoagland).

President George Bush proposed zero funding, while NIWR is requesting approximately $8.8 million for fiscal year 2008, an increase of about $2.3 million over fiscal year 2007 funding.

Since the early 1990's, funding has remained essentially flat at roughly $4.5 to $6.5 million per year. Approximately $92,000 is distributed to each of the 54 NIWR water resources institutes at universities each year, while the balance of roughly $1.5 million funds competitive, water-related grant projects at the member universities.

"While the total funding amount at both the local and national levels is small, it's critical to basic and applied water research, to outreach, and to training the next generation of water professionals," UNL Water Center director and NIWR president-elect Kyle Hoagland. "It's important that Congress understand how we stretch and leverage those small dollars to get important, state-specific results."

A second purpose of the meeting was learning more about federal water priorities and potential funding.

U.S. Geological Survey (USGS) director Mark Myers's keynote address reviewed six priority areas for USGS, including ecosystems and ecosystems change, the role of the environment to wildlife and human health, climate change, and national hazards reliance.

The list of water-related research and data collection needs in the USGS priority areas is lengthy. Included are increased understandings of the ability of ecosystems to purify water, water availability, the roles of deltas and food plains, the role of water in the transport of disease, and the need to update the water census last done in the 1970's.

Robert Hirsch, USGS associate director for water, outlined four major water areas needing attention: instream flows, the relationship between groundwater and surface water the sustainability of the resources, incorporating climate change into planning for water resources and catastrophic events, and the Clean Water Act.

While none of the topics is new, Hirsch employed an old paradigm/new paradigm approach to explaining why research and planning continues to be needed in all areas.

For example, Hirsch said the old paradigms for instream flows looked at the minimum flows needed in rivers for habitat, held that river channels were static, and focused on endangered species. The new paradigm looks at the whole river hydrograph, recognizing that channels are dynamic, and looks at ecosystem health. The old paradigm for groundwater/surface water interactions looked at shorter time frames and wells close to streams, while the new paradigm considers much longer time periods and greater distances between the two resources.

Sharon Megdal, director of the Arizona Water Resources Research Center, talks about her center's outreaching programming at the annual National Institutes for Water Resources conference in Washington D.C. (photo: Kyle Hoagland).

"One of the striking things in both Myers's and Hirsch's talks was the expressed need for multidisciplinary research in nearly every area they discussed. This confirmed again that the UNL Water Center and Water Resources Research Initiative (WRRI) are on the right track in encouraging collaborative efforts by faculty from multiple disciplines," noted Lorrie Benson, WRRI senior program manager.

Is Water Property?

By Sandra B. Zellmer and Jessica Harder

Sandra Zellmer

Jessica Harder

Sandra B. Zellmer is Professor and Hevelone Research Chair at the University of Nebraska College of Law and co-director of the UNL Water Resources Research Initiative. She recently completed a casebook, *Natural Resources Law*, published by Thomson/West in 2006. Zellmer received her LL.M. in environmental law from the George Washington University National Law Center, her J.D. from the University of South Dakota School of Law, and B.S. from Morningside College. Prior to teaching, she was a trial attorney in the Environment and Natural Resources Division of the U.S. Department of Justice, litigating public lands and wildlife issues for various federal judges.

Jessica Harder is the Water Outreach Associate with the University of Nebraska Rural Initiative and the UNL Water Center. She graduated from the University of Nebraska College of Law with a J.D. and a certificate in Natural Resources and Environmental Law.

(*Editor's Note*: This article first appeared in the March 2007 issue of *The Nebraska Lawyer* magazine. Reprinted with permission, © 2007 Nebraska State Bar Association).

Introduction

One of the most controversial issues in natural resources law is whether interests in water are property. In the western United States, water is typically viewed by appropriators as a form of private property, while in the East it is not. In either case, the law is surprisingly unsettled, notwithstanding the important consequences that follow, particularly under constitutional takings jurisprudence.

Treating water as property has significant implications for investment, conservation and environmental protection as well. Establishing secure property rights can foster stewardship and wise investment of labor and capital. By the same token, the absence of property ownership can result in a "tragedy of the commons," where a common resource is plundered as each selfish, yet economically rational, actor takes steps to promote self-interest with little regard for externalities that deplete the resource. On the other hand, public ownership of water is deeply embedded in western legal traditions, in recognition that water is essential to all life and must be safeguarded to prevent depletion and ensure satisfaction of a broad range of public needs.

This brief essay considers whether interests in surface water are property. Just over a year ago, in *Spear T. Ranch v. Knaub*,[2] the Nebraska Supreme Court held "no," but provided scant analysis in support of its conclusion. We assess both the nature of property and the nature of water, and then turn to the implications of treating water as property (or not) in Nebraska. These topics are the subject of a longer article in progress, which looks at water rights nationwide.

I. What is Property and Why Do We Care?

Property law helps create and safeguard stable relationships between persons and things, allowing property owners to extract the greatest value from that relationship and to protect it against competing claims.[3] Characterizing a thing as property has significant legal ramifications. First, it is essential for establishing a Fifth Amendment takings claim against the United States or an expropriation claim under international investment treaties.[4] Characterization as property has many other important legal consequences. Take remedies, for example. Property rules are often enforced through injunctions, in contrast with tort or contract liabilities, which typically lead to monetary relief. Classification as property may also be determinative of issues involving mortgaging, the creation of present and future interests, and special treatment under federal or state tax laws (like conservation easements, amortization, or like-kind exchanges).

In spite of its importance, the concept of property is frustratingly ambiguous. According to the Restatement (First) of the Law of Property, the term describes "legal relations between persons with respect to a thing."[5] But of course, not all economic relationships give rise to property rights, and herein lies the rub, as they say. According to the Supreme Court, "only those economic advantages are 'rights' which have the law in back of them."[6] In *Klamath Irrigation District v. U.S.*, the federal claims court framed its struggle to define water rights as follows:

> **What is property?** The derivation of the word is simple enough, arising from the Latin *proprietas* or "ownership," in turn stemming from *proprius*, meaning "own" or "proper." But, this etymology reveals little. Philosophers such as Aristotle . . . and Locke each, in turn, have debated the meaning of this term, as later did legal luminaries such as Blackstone, Madison and Holmes . . .[7]

Among the scholars and jurists cited by the court, surely Sir William Blackstone is the most familiar to property law aficionados. The American view of private property in land has been indelibly shaped by Blackstone, who described it as "that sole and despotic dominion . . . over the external things of the world, in total exclusion of the right of any other."[8] Ironically, it is highly unlikely that landowners enjoyed unfettered rights to real property when this phrase was penned, and Blackstone himself expressed some misgivings about the notion of exclusive dominion. Regardless, the concept is still influential today and has taken on near-mythical proportions among property rights proponents.

No doubt, exclusivity is a key feature of a property right; some have argued that it is in fact *the* key feature of property.[9] One way to break down the concept of property is to consider whether an interest in a thing enjoys the standard incidents of property ownership: the right to use (or not), the right to convey, and especially the right to exclude. Interests in water, as described below, are neither exclusive nor freely conveyable. Although such interests include usage, it is forbidden to *not* use water for speculative, aesthetic, or any other purpose. Yet, this begs the question—if exclusivity or one of the other incidents is lacking or severely diminished, are we dealing with something other than property?

Here is where the "bundle of sticks" metaphor may be useful. Though this conceptual tool has garnered its share of criticism, it has been employed by countless law professors to illustrate the nature of interests in property to first year students, and has become part of the "intellectual zeitgeist" of American property law.[10] The bundle represents the sum total of rights one can have with respect to a parcel of land. The sticks in the bundle can be disaggregated without defeating the characterization of the parcel as property. A reversion, a life estate, a remainder, and a fee simple determinable each represent but one stick in the bundle of legally protected property interests. Likewise, a right to exclude, to use, and to convey are each but one stick in the bundle. Collectively, the various estates or, in the second example, the various incidents, add up to the whole bundle: the fee simple absolute.

What does the metaphor tell us about things other than land, specifically, water? For one thing, it illustrates that perhaps public rights in navigation, fisheries, recreation or water quality can comprise one of the sticks in the bundle without completely eviscerating the notion that a private interest to use the water is indeed property. But if we remove the exclusivity stick, which represents the very essence of property ownership, does the entire bundle fall apart, leaving us with a few scattered twigs, but not property? Conversely, are there still enough of the incidents or attributes of property left to justify treating the interest in water as property? In effect, this exercise brings us back to square one, but at the same time it prompts us to take a closer look at water and the various interests that are asserted in water.

II. Water is a Unique Public Trust Resource

There are at least two possible ways to unbundle the notion of property in water. The first is to consider whether water is a thing that is ever subject to ownership as a form of property. In other words, do water and relationships to water possess the essential characteristics of property: exclusivity, use, and transferability? Although this approach fosters stability in the rule of law, it is quite inflexible.[11] As first year law students learn, there are very few absolutes in the law. Yet, the Nebraska Supreme Court appears to have taken this path in the *Spear T* cases, described in Part III below.

An alternative path is to review the caselaw that has addressed the issue in various contexts and draw conclusions from those cases about the fundamental nature of water. Courts employ this method frequently, although they do not always articulate it as such. In *International News Service v. Associated Press*,[12] for example, the Supreme Court characterized the news as "quasi-property" for purposes of a dispute between newspapers, but refused to recognize property rights against the general public. This contextual approach allows decision-makers to treat a thing or relationship as property in one circumstance but not necessarily others, and in doing so it promotes flexible, equitable results.

Both alternatives require a close look at the elemental nature of water. Water is a unique resource. It is essential to all life. Its physical properties are unlike any other thing. There is no capacity for exclusive possession or use of water in a stream, a lake or even an irrigation ditch. It is constantly moving along the surface, seeping into the ground, evaporating into the air, and being taken up by plants, fish and other aquatic species. Quantities are never entirely certain; drought, precipitation, and even the practices of other users create ever-changing circumstances.

According to Professor Joseph Sax, who has written frequently on the nature of property rights, the uniqueness of water as a legal concern is universally acknowledged:

> The roots of private property have never been deep enough to vest in water users a compensable right to diminish lakes and rivers or to destroy the marine life within them. Water is not like a pocket watch or a piece of furniture, which an owner may destroy with impunity. The rights of use in water, however long standing, should never be confused with more personal, more fully owned, property.[13]

In systems built on English common law, surface water is viewed as a type of "public trust" resource, where the sovereign retains rights and responsibilities to protect the resource for the public. The public trust doctrine traces its pedigree to Roman law. Because water is an essential resource upon which all life depends, navigable waterways, tidal areas, shorelines and stream beds cannot be held exclusively in private hands, but are impressed with the *jus publicum*, the public right. Although the doctrine was adopted in the United States through the incorporation of English common law, there is "an astonishingly universal regard for communal values in water worldwide."[14] A review of Asian, African, Islamic and Native American laws reveals rivulets of the public trust doctrine flowing from all reaches of the basins of the world.[15]

The public trust doctrine has enjoyed modern staying power in caselaw at both the federal and state level. In the eastern United States, it undergirds the law of "reasonable use," where riparian land owners have usufructuary rights to water that flows through or past their land, but may not deplete the flow in a way that harms other riparians or interferes with public access. In the West, the doctrine is embodied in provisions that give authority to the state to administer appropriative systems and ensure beneficial use of water resources. The public trust, however, has rarely acted a significant curb on private appropriators' rights to water. In a marked deviation from this trend, the Supreme Court of California imposed it in *National Audubon Society v. Superior Court* (the Mono Lake case):

The state as sovereign retains continuing supervisory control over its navigable waters and the lands beneath those

(continued on page 16)

Fourth Annual UNL Water Law, Policy and Science Conference
Embassy Suites, Hotel, Lincoln
"The Future of Water Use in Agriculture"

March 26-27, 2007

Wally Wilhelm of the U.S. Department of Agriculture-Agricultural Research Service and UNL.

Vikram Mehta from The Center for Research on the Changing Earth System in Columbia, Md.

Colorado Supreme Court Justice Greg Hobbs was Monday evening's banquet speaker.

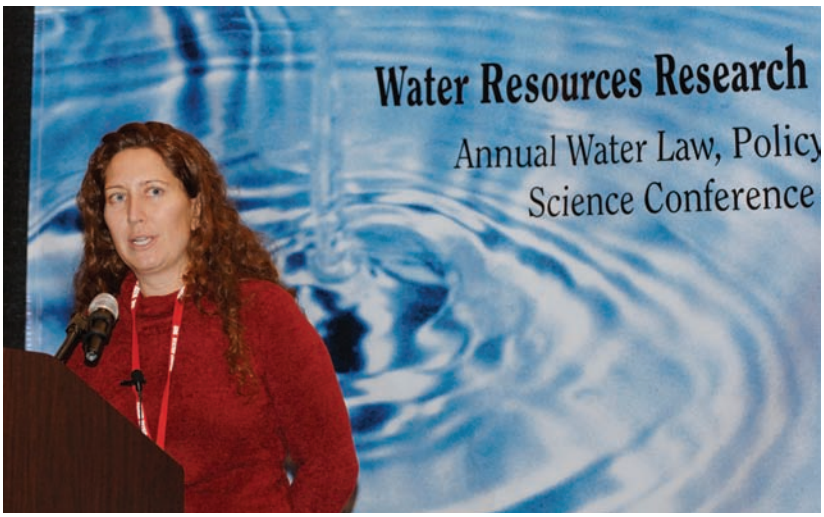
Syndicated columnist and conference luncheon speaker Alan Guebert.

Chad Smith, director of American Rivers' Nebraska Field Office.

NU Vice President and IANR Harlan Vice Chancellor John Owens (right) introduces Gale Buchanan, Under Secretary for Research, Education and Economics, U.S. Department of Agriculture.

Agronomist Ken Cassman, director of UNL's Nebraska Center for Energy Sciences Research.

Daryll Ray of the University of Tennessee, Knoxville, Tenn.



Pamela Nagler of the U.S. Geological Suvey in Tucson, Ariz.

(photos by Brett Hampton and Steve Ress)

Meet the Faculty

Simon Van Donk *(continued from page 3)*

were based on both remotely sensed data (AVHRR-NDVI) and precipitation data incorporated into simple water balance models. He worked intensively with large climate databases, helping personnel of the National Meteorological Services in the nine AGRHYMET member countries to organize their climate data.

Earlier, at the Evapotranspiration Laboratory of Kansas State University, he conducted research on the agroclimatology of the West African Sahel, analyzing precipitation data of this region trying to discover any patterns that might be used for seasonal prediction and proactive agricultural planning. During this period, he also developed and tested evapotranspiration and water balance models.

Selected Publications:

— Van Donk, S.J., L.E. Wagner, E.L. Skidmore, and J. Tatarko. 2005. Comparison of the Weibull model with measured wind speed distributions for stochastic wind generation. Transactions of the ASAE 48(2): 503-510.

— Van Donk, S.J., E.W. Tollner, J.L. Steiner, and S.R. Evett. 2004. Soil temperature under a dormant Bermudagrass mulch: simulation and measurement. Transactions of the ASAE 47(1): 91-98.

— Van Donk, S.J., and E.L. Skidmore. 2003. Measurement and simulation of wind erosion, roughness degradation and residue decomposition on an agricultural field. Earth Surface Processes and Landforms 28(11): 1243-1258.

— Van Donk, S.J., X. Huang, E.L. Skidmore, A.B. Anderson, D.L. Gebhart, V.E. Prehoda, and E.M. Kellogg. 2003. Wind erosion from military training lands in the Mojave desert, California, USA. Journal of Arid Environments 54(4): 687-703.

— Van Donk, S.J., and E.W. Tollner. 2000. Apparent thermal conductivity of mulch materials exposed to forced convention. Transactions of the ASAE 43(5): 1117-1127.

— Van Donk, S.J., and E.W. Tollner. 2000. Measurement and modeling of heat transfer mechanisms in mulch materials. Transactions of the ASAE 43(4): 919-925.

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Shannon L. Bartelt-Hunt *(continued from page 3)*

CIVE 327 – Environmental Engineering Laboratory
CIVE 424/824 – Introduction to Solid Waste Management
CIVE 823 – Physical/Chemical Treatment Processes
CIVE 828 – Environmental Engineering Chemistry

Selected Publications:

— Matott, L.S., Bartelt-Hunt, S.L., Fowler, K.R. and Rabideau, A.R. (2006). Application of heuristic techniques and algorithm tuning to a multi-layered sorptive barrier system. *Environmental Science and Technology* 40(20): 6354-6360.

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Web address:

http://www.engineering.unl.edu/academicunits/civil/faculty/hunt.shtml

Annual Tour Ready to Explore New Mexico's Lower Pecos River *(continued from page 1)*

1940's, and subsequent litigation, have limited consumptive water use by Nebraska and New Mexico.

Kansas sued Nebraska and Colorado citing excess water use in 1998 over Republican River water and the three states negotiated a settlement in 2002. Texas similarly sued New Mexico in 1974 over a claimed deficit of 1.1 million acre-feet of Pecos River water and the U.S. Supreme Court ruled in Texas' favor in 1987.

June's tour will look at how New Mexico has met its compact obligations since that court ruling 20 years ago.

Leaving Albuquerque on Monday, June 4, the tour stops first at Pecos National Historical Park to view displays and examine ancient pueblo ruins.

Afternoon programming and Pecos River basin orientation will be in Santa Fe. Discussions will be led by Eluid Martinez, consulting engineer and former New Mexico State Engineer and former commissioner of the U.S. Bureau of

Mike Jess examines ruins of the second mission complex at Pecos National Historical Park east of Santa Fe. The park will be a stop on June's Water and Natural Resources Tour (photo: Steve Ress).

Reclamation; Estevan Lopez, engineer, New Mexico Interstate Stream Commission; Elisa Sims, hydrologist, New Mexico Interstate Stream Commission; and Jay Stein, attorney, Stein and Brockmann, P.C., Santa Fe.

The tour leaves Santa Fe for Roswell Tuesday morning, June 5 and stops initially at the Nelson farm near Roswell.

Nelson sold irrigation rights to New Mexico, which now uses them to operate a nearby augmentation well field designed to pump groundwater directly into the river.

The tour then moves to the Schirmsher Ranch, where owners Fred and Ted Schirmsher will discuss production of pecans, chile and other crops. Participants will view fields and listen to the brothers discuss farming, irrigation and marketing of crops.

That evening, participants will be at the Roswell Museum and Arts Center for dinner and discussions led by independent real estate consultant Len Stokes and New Mexico state engineer John D'Antonio.

Wednesday, June 6 begins with a look at San Andres Formation artesian aquifer outcroppings, estimated at nearly 300 million years old, in the Roswell and Artesia areas.

New Mexico Bureau of Geology and Mineral Resources karst hydrologist Lewis Land will talk about the geological setting, historical groundwater irrigation development and resulting impacts.

In Carlsbad, former New Mexico state legislator Joe Steel, instrumental in enacting New Mexico's compact compliance program; Carlsbad Irrigation District (CID) general manager William Ahrens; CED board member Richard Forrest and others will speak at a luncheon before the tour heads to Carlsbad municipal park to view CID's flume crossing the Pecos River, and free-flowing groundwater springs located near there.

Land will discuss additional geologic features of the area and the occurrence of saline Pecos River flows into Texas.

Dinner and evening entertainment will be at the International UFO Museum and Research Center in Roswell.

Thursday, June 7's first stop is at New Mexico State University (NMSU) Agricultural Science Center near Artesia for a look at a 4,500-acre salt cedar eradication pilot project.

That project led to developing eradication procedures used throughout much of New Mexico. Leading the discussions will be NMSU Extension brush and weed scientist Keith Duncan.

Later, salt cedar eradication and control program discussions will be joined by Aaron Curbello, manager of Carlsbad Soil and Water Conservation District.

At Eastern New Mexico State Fairgrounds in Roswell, luncheon speakers will include Chaves County extension educator Shawn Dennis, Pecos Valley Artesian Conservancy District (PVACD) general manager Wesley Menefee, PVACD board member Brent Bullock, PVACD attorney Fred Hennighausen, long-time local grower Morgan Nelson and others.

The tour then leaves Roswell for the drive back to Albuquerque and dinner at M & J's Sanitary Tortilla Factory, which has provided "take-out" orders to Air Force One. It is also reported that former President Bill Clinton orders five gallons of green chile, five gallons of red chile and six dozen tamales from M & J's every December.

Tour co-sponsors are Central Nebraska Public Power and Irrigation District, Farm Credit Services of America, Gateway Farm Expo, Kearney Area Chamber of Commerce, Nebraska Association of Resources Districts, Nebraska Public Power District and UNL's School of Natural Resources and Water Center.

Planning and coordinating the tour has been Jeff Buettner, Central Nebraska Public Power and Irrigation District, Mike Jess and Steve Ress, UNL; Frank Kwapnioski, Nebraska Public Power District; and Sara Rector, Kearney Area Chamber of Commerce.

Assisting with the tour in New Mexico were Dennis, Duncan, Land, L. Greer Price, New Mexico Bureau of Geology and Mineral Resources, Socorro; Stein, Stokes and Maryann Wasiolek, Hydroscience Associates, Inc., Albuquerque.

The UFO Museum and Research Center in Roswell, N.M. will be a dinner and self-guided tour stop on the June Water and Natural Resources Tour (photo: Steve Ress).

Sandhills Dunes May Be More Stable Than Was Thought *(continued from page 1)*

Fifteen co-researchers from several scientific disciplines at UNL, such as geology, hydrology and ecology, have conducted different experiments on relevant issues such as drought, dune movement, groundwater recharge, and climate change, as well as interdisciplinary experiments.

One of these experiments is designed to study what would happen to the Sandhills if something such as climate change caused a loss of vegetation on the sand dunes. This is the primary focus of the project's Grassland Destabilization Experiment (GDEX): Understanding what might happen during the process of destabilization and what insights can be gained from that, said UNL School of Natural Resources grassland ecologist Dave Wedin. Wedin is the overall project's principal investigator and GDEX coordinator.

"We wanted to carefully measure and document some pieces of Sandhills landscape, and then basically kill the vegetation. Once the living plants are out of the story, we could see how long the landscape holds on," he said. "How long do the dunes stay intact? How long before sand starts moving? What are the factors controlling stability – whether sand stays in place or starts to move?"

His experiments are currently being done on about 30 acres of the former Barta Brothers Ranch; a 6,000-acre Sandhills ranch donated to UNL in 1996 by brothers Jim and Clifford Barta.

Researchers began by creating 10 circular plots, each 120-meters in diameter, or somewhat larger than a football field, and then using herbicide to kill all the vegetation on several of them. The plots continued to be treated with herbicide and kept free of vegetation for one to two years. Information, such as vegetation coverage percentage, root mass, soil organic matter and sand movement is monitored and recorded to determine the stability of the plots.

Wedin said results indicate the Sandhills may be more stable than previously thought. Areas that were killed two years ago are just now beginning to erode.

"In some ways that's surprisingly long, if you think of this as a very fragile ecosystem," he said. "We hurt the grass big time, and it still had enough integrity, mainly because of the ecosystem and the soils, to hold on for a couple years."

Wedin said vegetation was allowed to return to one set of plots initially treated with herbicide after one year. These plots showed a large amount of weed growth, but no soil erosion.

One of several football field-sized areas at Barta Brothers Ranch in the Sandhills that were cleared of vegetation using herbicides. The plots are part of interdisciplinary science experiments exploring the interactions of sand, grass and water and the stability of the Nebraska Sandhills (photo: Lorrie Benson).

UNL School of Natural Resources grassland ecologist Dave Wedin and associate director Dave Gosselin examine scientific test equipment associated with the ongoing biocomplexity study at UNL's Barta Brothers Ranch in the Sandhills (photo: School of Natural Resources).

While the experiment made significant progress studying the balance between soil, vegetation and water in the Sandhills, Wedin said additional experiments are needed to gain insight into what happens when sand dunes become mobile.

He also said future studies on the roles grassland grasses and shrubs play on the fields and dunes is needed since most comparable dune systems in other regions of the world are covered with shrubs and trees, which are rare in the Sandhills.

One of the biocomplexity project's outside goals was to lay groundwork and infrastructure for future studies.

"I think we've done a very good job of that," he said.

The Sandhills are the largest sand dune area in the Western Hemisphere and the stability of the area not only affects hundreds of cattle ranchers, but also recharge of the High Plains Aquifer, a vast groundwater resource reaching into eight High Plains states, including Nebraska, Colorado, Kansas and Wyoming.

Today the Sandhills are nearly completely stabilized by native grasses; but Wedin said previous research has shows a history of destabilization. The biocomplexity project has helped show how active this landscape has been in the last 1,000 years.

From the Director *(continued from page 2)*

representatives, to determine Nebraska's most critical water research needs; (2) WRAP compiled and examined the results of the state-wide query, and synthesized the information into a four-part state water research priorities list; (3) During a half-day forum, more than 40 NU water faculty members from diverse disciplines examined the list of research priorities and began identifying how they could make contributions to address the state's needs; (4) At a second retreat, water faculty prepared ten proposals, to address issues identified in each research needs category; (5) Panel members met with representatives from each of the 10 proposal teams for a Q&A session; (6) WRAP ranked the proposals in the order of importance for the state; (7) University administrators and WRAP members examined the panel's findings and identified internal and external funding options for the top four proposals; (8) The number one ranked project has been fully funded internally for the first year, with a combination of NU dollars, including a generous amount from the NU Rural Initiative and from NU's Institute of Agriculture and Natural Resources (IANR). Funding for the remainder of this project is being sought from external sources; (9) Substantial IANR funding for equipment for two of the other leading four projects, on top of NUs in-kind funding, provides a significant step toward getting this research underway; (10) With support of the WRAP members and other state water leaders, potential funding sources the WRAP identified for the top-ranked projects are being aggressively pursued.

Where do we go from here? Significant progress has been made with cooperation from a large number of people, both from within the University and from across the state, to better understand Nebraska's water issues and to collaborate to address water research needs. The University and WRAP are poised to move forward with several of the projects identified through this successful and evolving process. The WRAP and the University will continue to work together to address current and future water issues facing Nebraska.

Jessica Harder, our Water Outreach Associate in the Water Center (a position funded by the Rural Initiative), has served as the liaison and coordinator for Panel activities, and for water faculty activities associated with WRAP. She also contributed significant portions of this column!

From Kitchen to Countries: A Profile of the Groundwater Foundation

(continued from page 4)

celebrating its 75 year history of grant making. Currently, Test Your Well is "going global" with a new manual and interest from US EPA and national FFA.

Another new Guardian-related initiative is the Groundwater Guardian Green Sites program, designed to recognize specific locations for implementing groundwater-friendly practices such as minimizing the use of fertilizers and pesticides. Thanks to funding from the Nebraska Department of Environmental Quality and Nebraska Environmental Trust, 2007 Green Sites will include Nebraska locations from Arbor Links in Nebraska City to the Bayside Golf Course near Lake McConaughy. In keeping with the Foundation's reputation for measuring success, The Groundwater Foundation is developing a plan to gather pre-Green Site water data and monitor this data over time.

Collaboration with other organizations is almost always a central component of the Foundation's youth and community-based programs. For example, the Foundation sponsors "Awesome Aquifers" in partnership with the national Science Olympiad program. Awesome Aquifers is an event in which budding hydrogeologists study groundwater, answer questions, and build hydrologic models in competition. Another recent program, "H2O on the Go," brings festival-style groundwater activities to community venues such as summer playground programs, learning centers, churches, and nature preserves.

In recent years, the Foundation has relied on collaboration in sponsoring spring seminars on subjects with policy implications. Attracting many interested Nebraskans each year, seminar topics have included information about on-site wastewater treatment systems, stretching available water supplies, and the presence of pharmaceuticals and personal care products in groundwater. Seminar partners have included the Nebraska Department of Environmental Quality, University of Nebraska Water Center, and the Nebraska Attorney General's Environmental Protection Fund.

An inclusive philosophy and a focus on youth and community audiences have long been hallmarks of Foundation programs. Said Seacrest, "The Groundwater Foundation gives a voice to the hidden resource of groundwater and in doing so we are also a voice for the citizens it serves."

Water News Briefs

Water Efficiency Journal Available

Water Efficiency, The Journal for Water Conservation Professionals, is a new publication for those professionally involved with maximizing water efficiency. The journal is published bi-monthly and its first issue was September/October. Complimentary subscriptions are available to qualified professionals. Current and past issues are available online at http://www.waterefficiency.net/we.html Subscription and other information can also be found at that web site.

EPA Restoration Guide

The Handbook for Developing Watershed Plans to Restore and Protect Our Waters is a resource to help communities, watershed organizations, and local, state, tribal and federal environmental agencies develop and implement watershed plans to meet water quality standards and protect water resources.

The document is structured so that it can be followed step-by-step through the watershed planning process.

For a free copy, contact the National Service Center for Environmental Publications at (800) 490-9198 or email ncepimal@one.net. When requesting a copy, refer to U.S. Environmental Protection Agency document number: EPA 841-B-05-005. A handbook can also be downloaded online at http://www.epa.gov/owow/nps/watershed_handbook/

Sridhar to Boise State

Venkataramana Sridhar, a hydrologist and water resources specialist in UNL's School of Natural Resources and Department of Geosciences, accepted a tenure-track position as an assistant professor in the Department of Civil Engineering at Boise State University. Sridhar left SNR for the new position in late April. In three and a half years at UNL, Sridhar was involved in research in the areas of hydrology, water resources, hydrometeorology, soil moisture and drought, and others.

His new address is: Department of Civil Engineering, Boise State University, 1910 University Drive, Boise, Idaho 83725-2075.

Venkataramana Sridhar

USGS Groundwater Quality Report

The U.S. Geological Survey recently made available a report on *Ground-Water Quality Beneath Irrigated Cropland of the Northern and Southern High Plains Aquifer, Nebraska and Texas, 2003-04.*

A limited number of copies of the publication are available from the UNL School of Natural Resources Nebraska Maps and More store, on the web at http://nebraskamaps.unl.edu/home.asp or contact the USGS and ask for Scientific Investigations Report 2006-5196.

A PDF copy of the report can be downloaded to CD or other media from the USGS web site at http://pubs.usgs.gov/sir/2006/5196/

Make Every Drop Count

Kentucky bluegrass generally requires about 1-inch of water per week in April and May, 1.25 inches in June, 1.5 inches in July and August, 1.25 inches in September and 1-inch on October.

Water to the bottom of the roots. Use a screwdriver or soil probe to determine how deep the roots are and how far the water has soaked in. Try to keep the soil moist about a half-inch deeper than the deepest living roots, or to a depth of eight to nine inches if root depth is not known.

Water in the early morning (between 4 a.m. and 10 a.m.). Watering then is more efficient due to less evaporation and low wind speed.

Consider reducing the number of fertilizer applications, or reducing the amount of fertilizer applied to produce less growth and moisture loss.

Mow Kentucky bluegrass lawns at 2.5 to three inches; and tall fescue lawns in the three to four inch range to conserve moisture.

What's New at the UNL Water Sciences Laboratory

By Daniel D. Snow, Ph.D.
Director of Laboratory Services,
UNL Water Sciences Laboratory

The number of analytical services provided by the University of Nebraska–Lincoln Water Sciences Laboratory (WSL) continues to grow.

Since last year, we've developed several new methods for supporting environmental research including two for emerging contaminants. We are also updating several working areas in our facility.

Our liquid chromatography-tandem mass spectrometry (LC-MS) method for algal toxins includes five different microcystins, as well as other freshwater toxins such as anatoxin-a and cylindrospermopsin. Direct injection of processed water samples allows detection of these compounds to about 1 part per billion. We are currently working on an on-line extraction method that will permit detection limits around 5 parts per trillion (0.005 ppb).

One reason for needing to measure these naturally produced substances at such low levels is the increased confidence in contaminant detection. There is a 50:50 chance of a "false positive" or incorrect identification at a compound's detection limit for any given method.

Another reason is for studies examining the impact of these substances on drinking water supplies. For example, the U.S. Environmental Protection Agency recently issued a Request for Applications for research proposals to measure cyanotoxins in drinking water. A method that can go this low is needed in order to measure these and other similar contaminants in treated drinking water or in groundwater sources impacted by surface water where these contaminants are more likely to occur.

Another group of contaminants that we are using on-line extraction LC-MS is steroid hormones. Detection limits at the parts per trillion level are critical for accurate measurement of reproductive hormones such as estradiol and anabolic steroids trenbolone.

We are beginning work on a three-year study funded by EPA to understand the environmental fate and transport of steroid hormones from livestock feeding operations.

We are beginning work on a three-year study funded by EPA to understand the environmental fate and transport of these and other steroid hormones from livestock feeding operations. This project will require analysis of hundreds of samples for low levels of steroid hormones.

Recent studies by the U.S. Geological Survey and others have shown that parts per trillion levels of some steroid hormones are detectable in U.S. waterways. Scientists have shown that steroids such as these can have an impact on aquatic life at these levels.

Using on-line extraction method we can detect a suite of twelve steroids at concentrations as low as 0.5 parts per trillion in water using LC-MS with electrospray ionization.

When we use this method on highly contaminated samples such as wastewater however, we find that the other contaminants in the sample severely affects the sensitively of the method. Fortunately, we obtained funding to purchase a new ionization "source" for our LC-MS called atmospheric pressure photoionization. This new "Ion Sabre" source from Syagen Technology has been shown to improve ionization of hard to ionize compounds like steroids and at the same time overcome the matrix suppression issue so common in methods using electrospray ionization.

WSL chemist Dave Cassada and LC-MS technologist Teyona Damon have been instrumental in developing our methods and the UNL Water Center has helped in providing funds for the new "Ion Sabre" source to help get us going on this EPA study.

Finally, the offices and conference room in the WSL are undergoing renovation this spring. It's been almost 17 years since the building was renovated and we were sorely in need of new carpeting and a fresh coat of paint. Add some modular furniture left over from the School of Natural Resources recent move into Hardin Hall and we have a great "new" working environment for the WSL staff.

We plan an open house later this year to let people see some of the new equipment we have and the renovated spaces we are working in.

waters. This principle, fundamental to the concept of the public trust, applies to rights in flowing waters as well as to rights in tidelands and lakeshores; it prevents any party from acquiring a vested right to appropriate water in a manner harmful to the interests protected by the public trust.[16]

The Mono Lake decision is frequently cited by courts all across the nation, but it has had relatively little on-the-ground impact on the exploitation of water resources outside of California and a handful of other jurisdictions. Even so, the public trust doctrine is expressed in western legislation and caselaw through constraints on the use and conveyance of water, both of which are heavily regulated.

III. The Nature of Water Rights in Nebraska

Over-appropriation has become an almost insurmountable problem throughout Nebraska and in many watersheds of the West. This is hardly surprising. Prior appropriation arose during the late 1800s as a way to maximize use and promote settlement and economic development, and in fact it did just that, with little regard for the long-term sustainability of the resource or the communities—ecological and human—that rely on it.[17]

The prior appropriation regime, often described as "first in time, first in right," is an expedient means of determining who gets water, how much she gets and when. The Nebraska Supreme Court has described this system of distributing water according to appropriators' respective priorities as "undoubtedly enacted in furtherance of a wise public policy to afford an economical and speedy remedy to those whose rights are wrongfully disregarded by others, as well as to prevent waste, and to avoid unseemly controversies that may occur where many persons are entitled to share in a limited supply of public water for the purposes of irrigation."[18]

In the West, private interests in water use are typically ensconced in state constitutions. The Colorado constitution, for example, provides that "the right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied."[19] Yet another provision specifies that water is "the property of the state, and the same is dedicated to the use of the people of the state, *subject to appropriation* ..."[20] Courts have held that these provisions create compensable property rights to use water.[21]

Nebraska's constitution is similar, with an important distinction. It first provides that the use of water is dedicated to the people of the state, and goes on to proclaim: "The right to divert unappropriated waters of every natural stream for beneficial use shall never be denied *except when such denial is demanded by the public interest*."[22] This language has been construed by the Nebraska Supreme Court as allowing the legislature to define the "public interest."[23] Accordingly, statutes allow only beneficial use, require permits, forbid waste, and prohibit non-use through forfeiture provisions.[24] The legislature has also restricted transfers between domestic, industrial, and agricultural preference categories, and imposed strict requirements on transfers within each category to prevent harm to other appropriators.[25] More recently, the state has taken strides toward sustainable, integrated management of surface and groundwater resources through the enactment and implementation of LB 962 and other measures,[26] some of which might not have been possible if private interests in water were viewed as inviolate property rights.

In its 2005 opinion in *Spear T. Ranch v. Knaub*, the Nebraska Supreme Court summed up these provisions to conclude that "[a] right to appropriate surface water . . . *is not an ownership of property*."[27] As unequivocal as this sounds, the court tempered its statement in the next line: "Instead, the water is viewed as a public want and the appropriation is a right to use the water."[28] One might view this as a distinction without a difference, because rights to water have always been recognized as usufructuary—a right to use but not outright ownership in the corpus of the water *in situ*.[29] Given the usufructuary nature of water rights, appropriators' expectations of exclusive enjoyment are far less than those of landowners.[30]

The distinction between ownership of water and a mere right to use water, however, made a tremendous difference to the Spear T plaintiff, a surface water appropriator harmed by groundwater pumping. The court rejected Spear T's attempt to protect its "property" under a theory of conversion (an act of dominion wrongfully asserted over another's property), and left Spear T to tort remedies.[31] Likewise, Spear T's claim against the Department of Natural Resources for a taking of property under the Nebraska Constitution was dismissed.[32]

Curiously, the court cited only groundwater-related precedent in holding that Spear T had no property interest in its surface water.[33] In Nebraska, groundwater is not subject to private ownership; rather, it is owned by the state for the benefit of the public.[34] Indeed, "Nebraska law has never considered ground water to be a market item freely transferable for value among private parties."[35]

Previous surface water cases had concluded just the opposite: that appropriators who complied with statutory requirements did in fact possess vested property rights.[36] In 1952, *City of Scottsbluff v. Winters Creek Canal Co.* invalidated an ordinance that deemed open canals to be public nuisances and required owners to fill them or construct water pipes.[37] The court found that the ordinance was an arbitrary exercise of the police power, and opined in dicta that it would result in "confiscation of the company's property without due process or payment of just compensation."[38]

The issue was addressed directly in *Enterprise Irrigation Dist. v. Willis*.[39] There, the court held that the 1895 Irrigation Act, which limited appropriations to three acre-feet per acre, was not intended to apply retroactively. It conceded that the state may control the distribution of water to ensure beneficial use and guard against waste by virtue of its police power, but concluded that the statutory limitation could not be applied to an appropriation that vested prior to enactment. "That an appropriator of public water, who has complied with existing statutory requirements, obtains a vested property right has been announced by this court on many occasions."[40] The

court continued that the state's police power had never been expanded so far as to allow the legislature "to destroy vested rights in private property when such rights are being exercised and such property is being employed in the useful and in no-wise harmful production of wealth" unless use of the property is "shown to be inimical to public health or morals or to the general welfare."[41]

Perhaps *Spear T* evidences an evolution in the law to reflect modern social values, or perhaps the opinion is simply a more reasoned application of the long-standing notion that water is a "public want." Whether an emerging trend in the law is a deviation or merely a reflection of background principles of property law is an issue often raised in regulatory takings cases. State law takings jurisprudence typically follows Supreme Court precedent under the U.S. Constitution, where a governmental regulation that goes "too far" in impacting private property will be considered a compensable taking.[42] Once a property right is found to have been affected, courts employ a fact-based balancing approach that considers the effects of the regulation on reasonable investment-backed expectations and the character of government action.[43] In rare cases where a regulatory action causes a physical invasion of the property or denies all economically beneficial use, however, the balancing test is not applied; rather, a per se taking will be found.[44] That is, compensation must be paid unless the interest in question was already limited by a background principle of law that inheres in the claimant's title.[45]

Although background principles are generally found in state property law, when it comes to water, principles of federal law can also impose an inherent limitation on the claimant's interest. In *U.S. v. Rands*, the Supreme Court concluded that landowners adjacent to the Columbia River had no property rights as against the United States in any interests subject to the navigational servitude, including the flow of the water in the river, access to the water, and other values attributable to proximity to water: "these rights and values are not assertable against the superior rights of the United States, [and] are not property within the meaning of the Fifth Amendment . . ."[46]

Conversely, in *Tulare Lake v. U.S.*, the federal claims court awarded irrigators some $20 million when the Bureau of Reclamation curtailed contract allowances to provide flow for endangered species.[47] The court concluded that the plaintiffs had vested property rights by virtue of their contracts and California water law. Although there was "no dispute that [the supplier's] permits, and in turn plaintiffs' contract rights, are subject to the doctrines of reasonable use and public trust and to the tenets of state nuisance law," the court concluded that only the state Water Resources Control Board could modify the permit terms to reflect changing needs.[48] Because the Board had not done so during the period in question, the court declined: the laws "require a complex balancing of interests . . . and an exercise of discretion for which this court is not suited and with which it is not charged."[49]

The same court reached the opposite conclusion a few years later in a case arising in Oregon, *Klamath Irrigation District v. U.S.*[50] There, summary judgment was granted to the United States on the grounds that any interest the irrigators had in Reclamation water was contractual and not property. The court explicitly criticized the *Tulare* opinion for failing to assess the underlying nature of the interest in question to discern whether the plaintiffs in fact possessed property rights: "Tulare appears to be wrong on some counts, incomplete in others and, distinguishable, at all events."[51]

> Reluctant to delve into the nuances of the reasonable use and public trust doctrines, [in *Tulare*,] the Court of Federal Claims seized on [the Board's previous decision to grant the permit] . . . as the conclusive definition of the water rights . . . In essence, the court decided that an appropriator is legally entitled to engage in (and has property rights to) any conduct that is authorized by its water rights permit or license. This interpretation oversimplifies—and therefore misapprehends—the nature of California water rights.[52]

Notably, the public trust doctrine is an inherent limitation on interests in water, the exercise of which is not a taking.[53] In California, at least, the public trust doctrine forms a fundamental component of the water rights system. One distinction between California and Nebraska water law, however, is that the California code has been construed as providing the Board with continuing jurisdiction over water permits.[54] Although the Nebraska Department of Natural Resources has no parallel authority, it must remain vigilant against forfeiture or waste and scrutinize new appropriations and transfers to ensure that the public interest is satisfied.

Conclusion

What of the Nebraska Supreme Court's bold stance that "[a] right to appropriate surface water . . . is not an ownership of property?" It appears legally defensible, at least as between an appropriator and the state, on either of two grounds: (1) interests in water are not property at all when asserted against the state, acting to protect the public trust, or (2) interests in water are only quasi-property, restricted by inherent public trust requirements and the innate physical limitations of water. Arguably, the second rationale also justifies the dismissal of Spear T's property-based claims against groundwater pumpers, although this result seems less convincing. The court's sweeping conclusion is most difficult to justify as applied to disputes between individual surface water appropriators. An appropriator's right to use surface water *vis a vis* other appropriators is the very essence of the prior appropriation system, and the strongest stick in the appropriator's bundle of rights. In order for appropriators to execute water transfers, engage in water banking, conserve instream flows, or engage in the myriad of conventional beneficial uses, a clear characterization of what (if any) incidents of property inhere in a water right must be delineated in law and interpreted consistently by the courts. Moreover, adequate remedies for real world disputes between users must be available to water rights holders in order for the prior appropriation system to function and to evolve in a fashion that promotes both stability and the full range of values associated with water.

(continued on page 18)

Endnotes

[1]The views presented here are solely those of the authors.

[2]269 Neb. 177, 185, 691 N.W.2d 116, 127 (2005).

[3]Abraham Bell and Gideon Parchomovsky, A Theory of Property, 90 Cornell L. Rev. 531, 580-581 (2005).

[4]U.S. Const. Amd. V; North American Free Trade Agreement, U.S.-Can.-Mex., Dec. 17, 1992, 32 I.L.M. 612 (entered into force Jan. 1, 1994).

[5]Restatement (First) of Property (1936). *See Wood v Security Mut. Life Ins. Co.*, 112 Neb 66, 198 NW 573 (1924) (for purposes of construing a lease, "property" includes every interest that one may have in anything that is the subject of ownership); *U.S. v. General Motors Corp.*, 323 U.S. 373 (1945) (for purposes of the Fifth Amendment, "property" denotes the group of rights inhering in the relation to a thing, as the right to possess, use, and dispose of it).

[6]*United States v. Willow River Power Co.*, 324 U.S. 499, 502 (1945).

[7]*Klamath Irrigation Dist. v. U.S.*, 67 Fed. Cl. 504, 515 (2005), *cert. denied*, 69 Fed.Cl. 160 (2005).

[8]2 William Blackstone, Commentaries (Edward Christian ed., A Strahan 1823) (1800).

[9]*See* J.E. Penner, The "Bundle of Rights" Picture of Property, 43 UCLA L. Rev. 711, 717, 742-743, 766 (1996); *Dolan v City of Tigard*, 512 US 374, 384 (1994).

[10]Penner, *supra* note 9, at 715. *See* Myrl L. Duncan, Reconceiving the Bundle of Sticks: Land as a Community-Based Resource, 32 Entl. L. 773, 774 (2002).

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[12]248 U.S. 215 (1918).

[13]Joseph L. Sax, The Limits of Private Rights in Public Waters, 19 Envtl. L. 473, 482 (1989). *See* Joseph L. Sax, Understanding Transfers: Community Rights and the Privatization of Water, 1 West N.W. 13 (1994); Joseph L. Sax, The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention, 68 Mich. L. Rev. 471 (1970).

[14]Erin Ryan, Public Trust and Distrust: The Theoretical Implications of the Public Trust Doctrine for Natural Resource Management, 31 Envtl. L. 477, 478 (2001).

[15]Charles F. Wilkinson, The Headwaters of the Public Trust: Some Thoughts on the Source and Scope of the Traditional Doctrine, 19 Envtl. L. 425, 431 (1989).

[16]*National Audubon Society v. Superior Court*, 658 P.2d 709, 727 (1983) (emphasis added).

[17]Janet C. Neuman, Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use, 28 Envtl. L 919, 967 (1998).

[18]*Enterprise Irrigation Dist. v. Willis*, 135 Neb. 827, 830, 284 N.W. 326, 329 (1939). *See Farmers' Canal Co. v. Frank*, 72 Neb. 136, 100 N.W. 286, 294 (1904).

[19]Colo. Const. Art. XVI, § 6.

[20]Colo. Const. Art. XVI, § 5 (emphasis added).

[21]*Public Service Co. of Colorado v. F.E.R.C.*, 754 F.2d 1555 (10th Cir. 1985), *cert. denied*, 474 U.S. 1081 (1986); *Ackerman v. City of Walsenburg*, 171 Colo. 304, 467 P.2d 267, 270 (1970); *Farmers Irr. Co. v. Game & Fish Comm.*, 149 Colo. 318, 369 P.2d 557 (1962). But *see Central Colorado Water Conservancy Dist. v. Simpson*, 877 P.2d 335, 347 (Colo. 1994) (regulations that "somewhat . . . decrease" the amount of water available for use will not entitle an appropriator to compensation because there is no title to water flowing in the river).

[22]Neb. Const. Art. XV, §§ 5-6 (emphasis added).

[23]*See In re* Applications A-16642 236 Neb. 671, 463 N.W.2d 591, 604-605 (1990); *In re* Applications A-16027 et al. 242 Neb. 315, 495 N.W.2d 23, 31-34 (1993); Central Platte Natural Resources District v. City of Fremont 250 Neb 252, 549 N.W.2d 112,116-118 (1996).

[24]Neb. Rev. Stat. §§ 46.229 – 46.229.04, 46.231, 46.233.01.

[25]Neb. Rev. Stat. §§ 46-289, 46-294.

[26]Laws 2004, LB 962, operative date July 16, 2004 (codified in various sections of chapter 46, inter alia, of the Nebraska Code).

[27]269 Neb. 177, 186, 691 N.W.2d 116, 127 (2005) (emphasis added).

[28]*Id.*

[29]Richard S. Harnsberger, Josephine R. Potuto and Norman W. Thorson, Interstate Transfers of Water: State Options after Sporhase, 70 Neb. L. Rev. 754, 787 n.139 (1991).

[30]A. Dan Tarlock, Law of Water Rights and Resources § 3:10 (2006 update), citing *inter alia* Eric Pearson, Constitutional Restraints on Water Diversions in Nebraska: The Little Blue Controversy, 16 Creighton L. Rev. 695, 707 (1983); *In re* Applications A-16027 et al., 495 N.W.2d 23 (Neb. 1993), modified, 499 N.W.2d 548 (1993).

[31]269 Neb. at 185-186, 691 N.W.2d at 127. For commentary, see LeRoy W. Sievers, Nebraska Water Law Facing Dramatic Changes in our State: The Spear T Ranch Case, *Neb. Law.*, June 2005, at 14; Donald Blankenau et al., *Spear T Ranch v. Knaub:* The Reincarnation of Riparianism in Nebraska Water Law, 38 Creighton L. Rev. 1203 (2005); J. David Aiken, Hydrologically-Connected Ground Water, Section 858, and the Spear T Ranch Decision, 84 Neb. L. Rev. 962 (2006).

[32]*Spear T. Ranch v. Nebraska Dept. of Natural Resources*, 270 Neb. 130, 139, 699 N.W.2d 379, 386 (2005).

[33]*Spear T Ranch*, 269 Neb. at 185-186, 691 N.W.2d at 127, citing Richard S. Harnsberger & Norman W. Thorson, Nebraska Water Law & Administration § 5.27 at 266-67 (1984); State *ex rel.* Douglas v. Sporhase, 208 Neb. 703, 305 N.W.2d 614 (1981), reversed on other grounds, 458 U.S. 941 (1982).

[34]Neb. Rev. Stat. § 46-702.

[35]Sporhase, 208 Neb. at 705, 305 N.W.2d at 616; *Bamford v. Upper Republican NRD*, 245 Neb. 299, 512 N.W.2d 642 (1992); *In re* Application U-2, 226 Neb. 594, 605, 413 N.W.2d 290, 298 (1987); *Prather v. Eisenmann*, 200 Neb. 1, 7, 261 N.W.2d 766, 770 (1978). But see *Sorensen v. Lower Niobrara Natural Resources Dist.*, 221 Neb. 180, 376 N.W.2d 539 (1985) (superseded by statute).

[36]Joseph A. Kishiyama, Note, The Prophecy of Poor Dick: The Nebraska Supreme Court Recognizes a Surface Water Appropriator's Claim Against a Hydrologically Connected Ground Water User in *Spear T Ranch, Inc. v. Knaub*, 85 Neb. L. Rev. 284, 285 (2006).

[37]155 Neb. 723, 728-730, 53 N.W.2d 543, 547-548 (1952).

[38]155 Neb. at 728-730, 53 N.W.2d at 547-548.

[39]135 Neb. 827, 830, 284 N.W. 326, 329 (1939).

[40]*Id.*

[41]*Id.* at 331, citing *Herminghaus v. Southern Cal. Edison Co.*, 200 Cal. 81, 252 P. 607, 622, *cert. dismissed*, 275 U.S. 486 (1927).

[42]*Pennsylvania Coal Co. v. Mahon*, 260 U.S. 393, 413 (1922).

[43]*Penn Central Transp. Co. v. New York City*, 438 U.S. 104, 123-24 (1978).

[44]*Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992).

[45]*Id.* at 1029.

[46]389 U.S. 121, 126 (1967).

[47]49 Fed. Cl. 313 (2001).

[48]*Id.* at 324.

[49]*Id.* at 323-24.

[50]67 Fed.Cl. 504, *cert. denied*, 69 Fed. Cl. 160 (2005).

[51]*Id.* at 538.

[52]Brian E. Gray, The Property Right in Water, 9 Hastings W.-Nw . J. Envtl. L. & Pol'y 1, 9 (2002), citing 49 Fed. Cl. at 324. For a contrary view, see Douglas L. Grant, ESA Reductions in Reclamation Water Contract Deliveries: A Fifth Amendment Taking of Property?, 36 Envtl. L. 1331 (2006).

[53]*See* Melinda Harm Benson, The Tulare Case: Water Rights, The Endangered Species Act, and the Fifth Amendment, 32 Envtl. L. 551, 571 (2002).

[54]

"God's Kitchen" Blends Environmental, Religious Messages

By Lorrie Benson

Their efforts may be framed as stewardship, creation care, or environmental protection.

Regardless of what they are called and the denomination involved, many faith communities are taking a more active role in protecting the environment.

"In our church we're talking about what our stewardship responsibilities are. We believe we have a responsibility to keep things as nice as they were when we got here," explained Troy Kash-Brown, of Lincoln's First Plymouth Congregational Church environmental committee.

To put its beliefs into action, the church teamed with The Groundwater Foundation, a national nonprofit organization with a mission of encouraging people to care about groundwater. Together they created "God's Kitchen," an afternoon and evening of fun, hands-on water education activities, worship, and a soup supper for approximately 60 adults and children on March 10.

"We melded the activities of educational water festivals with the sense of community and fun a church social activity provides and came up with God's Kitchen," said Groundwater Foundation president Susan Seacrest, a member of First Plymouth. "The model we created combining fellowship with conservation education is one any faith community could adapt to meet its needs."

The afternoon began with four Groundwater Foundation staff training the church's environmental committee how to run several different water education activities set up at different stations around a large dining room.

Activities included water cycle bracelets, terrarium construction, the story of Freddie the Fish, and a game played with a beach ball resembling a globe. Committee members passed out information to adults such as flyers on water-wise plants and locally grown foods.

"I think it was an 'aha' moment for some of the adult volunteers," observed Jamie Oltman of The Groundwater Foundation. "They may not have thought of themselves as environmentalists before, but this event helped them understand that all of us are connected to water."

Groundwater Foundation staff (from left) Susan Seacrest, Carla Otredosky, Cindy Kreifels and Jamie Oltman at Lincoln's First Plymouth Church to help lead a program combining environmental stewardship and Christian messages, called "God's Kitchen" (photo: Lorrie Benson).

According to Trish Souliere, chair of First Plymouth's board of Christian education, that message is one event organizers hoped to get across. "Our message is one of interconnectivity. People – especially children – may not remember a lot of details, but we want people to remember that water is in a big cycle. We think the visual, hands-on helps bring education to a level everyone can understand."

Youngsters take part in one of several hands-on environmental stewardship activities during an afternoon of fun, education and food designed to help people care about groundwater. "God's Kitchen," as the program was called, was held at Lincoln's First Plymouth Church in April (photo: Lorrie Benson).

Souliere herself is an example of a church member who learned something new. "The surprise for me was learning about the water issues facing Nebraska today and that we're doing things today that could have long-term negative impacts," she explained.

Following the afternoon's activities was the church's usual Saturday evening worship service with an unusual visitor, Mary, the mother of Jesus. In a television-style interview, Mary (played by Seacrest wearing robes) explained the importance of water to Christians and why Christians should care about the environment.

"We had a serious message to get across, but we also wanted to make it fun and engaging. This is an example of an area that could be adapted by other churches. Our Oprah-style interview suited our congregation, but another church might prefer a more traditional sermon," Seacrest noted.

Following the service was a stewardship supper featuring bread and soup made during the afternoon Edible Aquifers, combining basic aquifer construction information with ice cream, became dessert.

"We talked with people about the connection between the environment and our food supply," explained Kathie Johnson, Christian education director.

God's Kitchen is the first in a series of programs First Plymouth's environmental committee and board of Christian education plan to offer. Coming soon will be events on air, soil, trash and recycling, and energy topics.

Help Improve the *Water Current*

With each issue of the *Water Current*, we strive to deliver the water-related information you need from the University of Nebraska–Lincoln.

You can help us do that by taking a few moments of your time to complete this questionnaire and send it to us. If you do, we will enter your name in a drawing for one of three Water Center Rapalla fishing lures and one of three Water Center umbrellas.

To be eligible for these drawings, return your completed survey to Steve Ress, UNL Water Center, P.O. Box 830979, University of Nebraska, Lincoln, NE 68583-0979 or FAX it to (402) 472-3574 by Friday, June 22. UNL subscribers may return surveys via campus mail to 913 HarH, EC, 0979.

Mail or FAX the entire page (so we have your name and address for the drawings). Survey responses are held in confidence and are used only by the *Water Current's* editorial staff.

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